# A NEW APPROACH TO THE PRIDNESTROVIAN LABOUR MARKET

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# Outline

## Abstract

The development and application of the Summers' efficiency-wage model (1988) applied over the Pridnestrovian labour market highlighted the job unitability in the region after the enforcement of the free trade agreement between the EU and Moldova, in July 2016, that did not include Pridnestrovie.

Because of the current situation, the Pridnestrovian macroeconomic variables, as well as the whole governmental policies, have moved towards the stabilization and to guarantee job safeness and competitiveness. Nevertheless, results show the impact on the short-run and the application of the Summers' model shows differences among risk sources of the labour market.

For this project the model will be followed to some extent and new concepts will be included, such as: the calculation of its parameters or the introduction of the *b-value*. Therefore, there is an opportunity to achieve competitive economies of scale by promoting those ones with lower rates of *b-value*.

## Foreword

Before to proceed to the reading of this paper I would like to highlight that, due to the complex situation of the Pridnestrovian Moldavian Republic, the aim of this project is economic; not political nor propagandistic.

The main incentive, to choose Pridnestrovian case, was the fact of its peculiarity in economic terms that made Pridnestrovie idoneal for this exhaustive analysis: its size, its openness index, a clear active use of the monetary policy and the existence of periodic reports give us the chance of knowing better the adaptation and development of the free market, after the USSR collapse, and the usefulness of macroeconomic models, in order to predict and adapt certain policies towards of economic growth and social development.

All in all, I hope you enjoy the reading and get in touch with Pridnestrovie.

*Eduardo Pérez de Lara y Sánchez*

## Motivation

During last decades, few studies have been focused in Pridnestrovian economy, mainly because the lack of interest of the region or due to the lack of comparable data. Nevertheless, due to its geographical, economic and political situation, Pridnestrovie proffers a perfect scenario to investigate macroeconomic models

Thanks to the efforts of the Pridnestrovian Government to achieve a certain level of macroeconomic data reports a new opportunity arises: to analyse and evaluate the Pridnestrovian labour market by developing the Summers' (1988) efficiency-wages example.

Now, Pridnestrovie is facing one of its most turbulent periods, in macroeconomic terms, because of after the enforcement, in July 2016 of the European Union–Moldova Deep and Comprehensive Free Trade Area (EU–Moldova DCFTA) Pridnestrovie has been facing some mismatches in its macroeconomic variables, due to the access of Moldova to the European Single Market and the no consideration of Pridnestrovie in this trade agreement, as former Pridnestrovian President Shevchuk stated in 2014 for Euronews[1].

As a result, the Pridnestrovian Government has been taking several actions to revert this situation by applying several reforms in the labour market and developing plans to attract population and develop the national industry. Even though it will take time to determine the effectiveness of them.

All in all, the attractiveness of the application of the Summers' (1988) example can set a precedent to go further with the economic investigation in the region and the development of macroeconomic models that may help to move forward to events and prevent the Pridnestrovian economy from any future maladjustment and to evaluate the attractiveness and the "ergonomics" of the Pridnestrovian labour market.

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[1] **Euronews** (2014). *Interview: Transnistran president Shevchuk says he wants a ''civilised divorce'' with Moldova.* Consulted on: 14 June 2018 – https://youtu.be/x29ifVPvN-w

## Introduction and fundamental definition

The Pridnestrovian Moldavian Republic (also known as Pridnestrovie or Transnistria) is *a sovereign, independent, democratic and legal state*[2] located in the main Eastern side of the river Dniester between Moldova and Ukraine. It controls an area equal to 4,163 km[2] and a population of 470,600[3].

The Pridnestrovian Moldavian Republic became independent, from the Moldovan Socialist Soviet Republic, during the collapse of the Soviet Union in September 1990. However, the independence of this state was not made effective until July 1992. Notwithstanding, regarding the international law, the Pridnestrovian Moldavian Republic is a non-recognized state since almost no country has made any statement concerning the Pridnestrovian sovereignty. The Republic of Moldova considers it part of its territory under the recognition of *the Transnistria autonomous territorial unit*[4].

Organized as a unitary semi-presidential republic, uses as national currency the Pridnestrovian ruble, issued by the Transnistrian Republic Bank[5] and pegged to the United States dollar. In the regulatory sphere both ministries of *Economic Development* and *Labour and Social Security* organize the labour legislation, jointly with the *Transnistrian Republican Bank* authorities which develop the monetary policy.

Regarding the economic model of Pridnestrovian Moldavian Republic *recognizes, protects and ensures all kind of ownership*[6] *and free market activity*[7]. Thus, it can be studied with the rest of the market economies, using the same methods of analysis. In this paper, all the attention will be focused on the analysis of the Pridnestrovian labour market.

Therefore, we define as a market the medium in which buyers (demanders – the ones who have the item claim money, in exchange) and sellers (suppliers – the ones who have the money and claim the item) interact and make choices depending on their individual preferences. Both match the optimum bundle of quantity and price per item, they are willing to pay (demand) or receive (supply) in exchange.

Hence, the labour market it is the medium that matches both: workers (suppliers) and employers (demanders), in this case, the tradable item is each one's individual work.

The monetary perception of this exchange is the wage (w), that defines the value of each bundle of specific work, since the price is the indicator that agglutinates all information relative to the item it refers to.

Nevertheless, the labour market is not under perfect competition (where there is a fully match between suppliers and demanders). Therefore, there are some existent frictions that influence the perfect match (the

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[2] **Pridnestrovian Constitution** – Section I, article 1 (20th August 2016)
[3] According to the Statistical Yearbook – 2017 *(Статистический ежегодник – 2017)*
[4] **Moldovan Parliament** – Law 173, article 3 (22nd July 2005)
[5] **Pridnestrovian Constitution** – Section III, article 100 (20th August 2016) – Main website: http://www.cbpmr.net
[6] **Pridnestrovian Constitution** – Section I, article 4 and Section II, article 37 (20th August 2016)
[7] **Pridnestrovian Constitution** – Section II, article 36 (20th August 2016)

fully employment) and create some maladjustments. These maladjustments create a misleading situation in which despite the will of some workers to work, there is no demand for this kind of job. This produces a situation of unemployment (u), known when there is the lack of workplaces of any individual which is actively willing to work but cannot.

Hence, these situations may induce some social issues that make coherent and worthy to help, to subsidize, those individuals who are currently unemployed, but looking for a job. Generally, it is less than the normal wage perceived for the job and it allows to keep certain standard of living.

All these concepts will be analysed in this paper, following, step by step, the logic of the of the genuine paper of Kreuger and Summers (1988): "*Efficiency Wages and the Inter-Industry Wage Structure*", later shown in Romer's example in the manual *Advanced Macroeconomic*, chapter 10: *"A generic efficiency-wage model".*

The application of *"the efficiency-wage model"* will be determined by the main parameters exposed in Summers' *efficiency wages* and *unemployment* papers. Nevertheless, the development of the practical analysis and the estimation of the internal variables it will be define later.

Likewise, to have an accurate view over the evolution of competitiveness of the labour market in Pridnestrovie it will be used the analysis of the Unit Labour Costs (ULC) over time, as main indicator. Similarly, the application of second-generation models of currency crisis will be included in order to have an overview of how the fixed exchange rate affected to the behaviour of the labour market in the recent years.

All in all, Pridnestrovie has a large openness index[8], mainly due to its need of importing groceries and basic products for daily life. Moreover, the "trade of workers" (the labour migrations) could reflect how the marginal cost of emigrate can decrease because of proximity (language, cultural factors, proximity, political relations...) that are explained in the $\alpha$ term in the application of some theories, as the Gravity Model, which relate the distance and cultural similarities with trade.

In conclusion, there are so many reasons to be explored and perspectives to focus our analysis, nevertheless, in this case, the main research it will be based on the competitiveness, the elasticity of wages and the effectiveness of the labour market structure in Pridnestrovie.

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[8] Reflected in the annual macroeconomic reports of the Transnistrian Republican Bank (2004-2017).

## Related works

The analysis of the Pridnestrovian labour market is quite developed, since there are some research lines involving several aspects of its nature that can be grouped in three non-excluding categories: migratory issues, structural analysis and social policy.

Migratory issues and its impact in the social policy have been widely explored by Volkova and Ostavnaya in their multiple papers such as: *"Transnistrian labour migration: strokes to potential social policy"* (2014) and *"The prospects of social policy in the sphere of labour migration in Transnistrian region"* (2015, jointly with Bystryantsev). In their studies they focused the analysis on the source of the labour migration Pridnestrovie suffers, since the volatility of the labour force and the strong migrations lived during last 10 years that decreased, in one-year time by a 10% the whole population (between 2009-10) may show the impact and main destinations of emigrated workers: Moldova, Russia, Ukraine, Belarus…

Although, the most significant result, is that 90% of whole Pridnestrovian emigrants decide to go to Russia. As shown, the causes of Pridnestrovian migration movements published in Volkova, Ostavnaya and Zamaletdinova study: *"Trans-Dniester labour migrants on the territory of recipient country: quality of life and employment"* (2015), the main motivations to immigrate (basically to Russia or EU) are (quoted reasons):

- Economic situation – 60.8%
- Financial struggles – 52.0%
- Job difficulties – 26.5%
- Delayed salary issues – 21.6%
- Lack of life prospects – 52.9%
- Political crisis – 18.6%
- Reduction of social aids – 5.9%

In spite of, the main attractive of the labour market, outside Pridnestrovian borders, is the possibility of having a better paid job (90.2%), better job conditions (41.2%) and professional growth (19.6%).

Also, Fomenko and Krivenko explained the *"Economic-geographical aspects of labour migration of the population of the Moldovan region of Transnistria"* (2011) forecasting the need of an urgent and effective migration policy by:

- Ensuring workers' rights to freedom of movement and employment
- Guarantees for the return of migrants to their homeland
- Mitigating the unemployment, thanks to the departure of non-demanded-jobs workers
- Restriction of the departure of employed in those sectors of the economy whose needs in the workforce are not satisfied
- Improvement of the domestic labour market through the reception of returnees who have mastered abroad the specialties necessary for the development of the national economy
- Providing social guarantees to emigrant workers

In their study, the beneficial side of this emigration is also evaluated concluding that Pridnestrovie can dilute the unemployment, of those positions which have barely demand, thanks to this migration scheme, and provide currency remittances while sending back to their family in Pridnestrovie.

Nevertheless, the most descriptive analysis of the structure of the labour market in Pridnestrovie has been done by Terzi as Ph.D. candidate during her stay in the Taras Shevchenko Transnistria State University.

Terzi has analysed several aspects of the structural problems of the Pridnestrovian labour market that arise after the Great Recession which provoke a significant migration and a maladjustment of the working population (which is now under the sustainability level). These macroeconomic adjustment lead to a negative net natural growth of the population and an improvement of the competitiveness, thought the elimination of low-skilled works. As analysed in: *"Problems of employment and unemployment in the Pridnestrovian Moldavian Republic"* (2011).

In the same paper it is shown that the average turnover time needed to fulfil the demand of workers in some specialized works (such as: mechanics, seamstresses…) requires 3-6 months to fill up to 30% of the whole job positions. While non-skilled jobs had a turnover time up to 1 month to fulfil all the demand of it.

This fact influences, in a bidirectional way, the internal structure of the labour market:

− **Increase in competitiveness**: it decreased the cost of labour (due to the voluntary resigns and the need of accepting bad-paid job offers)
− **Decrease in specialization**: it decreased the demand of specialized labour, due to the progressive decreasing industrial sector with low wages (also delays and cuts) that motivated migration.

In *"Peculiarities of social and economic policy in the Pridnestrovian Moldavian Republic"* (2013) Terzi analysed the financial issues, derivate form the mismatch in the labour market. In order to overcome this adverse situation, the Pridnestrovian government developed a plan for 2025 which would try to:

− To increase by 50% the number of jobs, by 2025
− To decrease by 50% the labour migration, by 2025
− To develop a productive structure based on high-skilled workers
− To rearrange the land ownership to increase its productivity
− To implement a youth support program (to attract active population, acquire skilled background and to solve the rate of natural increase)
− To promote the setting of industries in Pridnestrovie and develop fiscal incentives
− To stabilize the inflation[9]

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[9] Notice that the paper reflects some measures applied before the devaluation of 2017.

The lack of attractiveness for youth to train was also studied by Smolenskiy in *the "Demographic situation and migration situation in the Pridnestrovian Moldavian Republic, their influence on the formation of the regional labour market."* (2007) since the lack of perspectives discouraged youth to train further.

Thus, as proposed by Terzi in *"Ways of management of processes of formation of competitive labour force in Pridnestrovie in the conditions of transition to the innovation economy"* (2013) and *"The peculiarity of forming qualificational and intellectual labour market"* (2014), the Pridnestrovian labour market main challenges that need to be solved are: to increase the skilled-labour force, to increase the investment, to match the supply and demand of workers (need to reform the educational system) and to develop a new labour market law (that is clear, consistent and promotes investment).

The idea of adding incentives to new investors and the reform of the educational system could lead to a "needed" increase in wages and the development of the innovative economy in the Pridnestrovian Moldavian Republic. Social policy implications of this ambitious project have been already applied.

As forecasted by Burla in *"Statistical analysis of the dynamics of value, inter-branch and territorial differences of earning costs in the Transnistrian region"* (2015) the trends in the labour market were clearly different among sectors in Pridnestrovie, as data showed:

- Highest wages: electricity, telecommunications, banking, insurance, manufacturing, construction and science
- Lowest wages: post (4.58), social security (4.53) and agriculture (4.3)

The gap among activities was about 4 times[10] an average salary for low-wage than high-wage activities, during 2007. This fact has a direct effect on migration, attracting non-skilled labour from other countries and send nationals abroad. Even though, the source of the problem is not this one given the fact that the net migration balance has been negative for last decade, since crisis started.

Nonetheless, the main question of "how elastic" and "how costly" would be the adjustment of wages during this period of competitiveness adjustment has not been developed yet. Therefore, in this paper the main analysis will be focused on quantifying the impact of these policies and its trends.

Nevertheless, the accumulated inflation during the period 2011-2015 forced Pridnestrovie to an internal devaluation. Burla, in his conclusions, remarked that: *the growth of wages should be in direct dependence on the dynamics of labour productivity. It should be noted that, for several years, this correlation was absent.*

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[10] Check numbers between brackets.

## Model

THEORETICAL BASIS

First, to analyse the competitiveness, elasticity and efficiency of the Pridnestrovian labour market, as a single entity, it is necessary to define the main parameters and models that should be used.

To focus the analysis on the competitiveness it will be used the analysis of the Unit Labour Costs (ULC) will be used over time as well as the evolution after the depreciation of the ruble in 17 June 2017 (-32.7%).

Unit Labour Costs are the expression of how many monetary units are included in each amount of product of this economy. As an indicator of the cost of labour, it can be used to analyse the evolution of the labour market degree of competitiveness.

$$\textbf{\textit{Unit Labour Costs}} \ (ULC) = \frac{wages}{productivity} = \frac{w}{\frac{Y}{L}} = \frac{wL}{Y}$$

It is common that neighbouring countries with a persistent gap in LUC over time (as it happened in the European Union after the monetary union) end up by having negative effects in the mid or long-run having the need either to devaluate (easier, faster and softer) or to implement an internal devaluation (more costly and aggressive).

Regarding the efficiency wages models, these are a set of assumption, mainly based on Solow (1979) and Summers (1988) studies of the labour market efficiency, that relates a certain number of variables: unemployment level, market wage, production and effort, but also the elasticity of the effort towards the wage premium received and the level of concern of the working population of being unemployed.

Before going further, it is necessary to follow, step by step, the example settled by Romer (1996) in the manual *Advanced Macroeconomic*, chapter 10: *"A generic efficiency-wage model"*[11]. It is generally named as: *"A Simple Efficiency Wage Model-Romer 9.2"*, then all assumptions and implications of it will be checked and explained while the practical part is solved.

This model solves the optimization functions of the employer and the employee. Then, in this case, it is a model that requires the main assumption that Pridnestrovie is taken as a single entity (because of its size) and the set of assumptions that Romer attributes to the firm would be given to the whole country, as a unit.

Finally, the effectiveness of the monetary policy in this paper will be analysed by developing the theoretical part of the unsustainability of this wage growth and the effects on the pegged currency will be analysed in this paper by applying second-generation models of currency crisis from Obstfeld's paper (1986).

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[11] Main derivations of the model are exposed in Annex 1.

UNIT LABOUR COSTS ANALYSIS

Unit Labour Cost analysis is helpful to determine the cost of the labour in each country and to compare it among countries. The fact that neighbour countries have that significant effect over the others follows the logics of Isard's Gravity Model (1954) that relates the proximity of two countries and their trade level.

$$\textbf{\textit{Total trade among neighbour countries}} = \textbf{\textit{T}}_{ij} = \alpha \cdot Y_i \cdot Y_j \cdot Distance_{ij}$$

So, as in any tradable good, the labour has a price and it is somehow tradable, that is why migrations occur and they are so crucial for Pridnestrovian economy. Nonetheless, due to some barriers as political circumstances or national currency it will be convenient to analyse the evolution in United States dollars, to have a reliable comparison.



Graph 1 — *ULC evolution in Pridnestrovie*
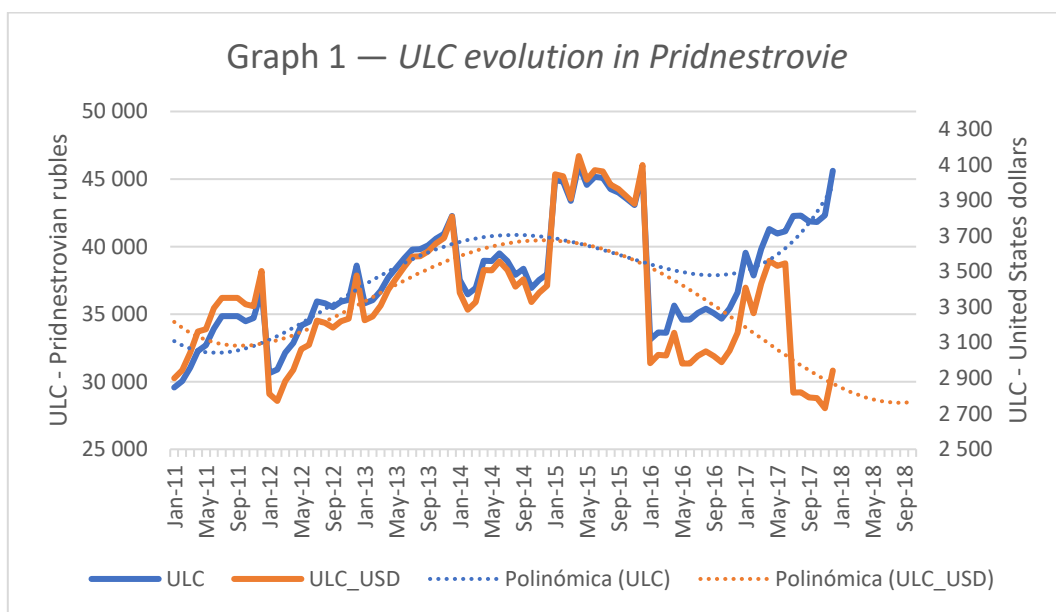
*Trend ULC:* $y = 7 \times 10^{-9}\, x^4 - 0.0011\, x^3 + 68.815\, x^2 - 2 \times 10^6\, x + 2 \times 10^{10} \rightarrow R^2 = 0.5468$

*Trend ULC_USD:* $y = 3 \times 10^{-10}\, x^4 - 5 \times 10^{-5}\, x^3 + 3.0942\, x^2 - 86\,638\, x + 9 \times 10^8 \rightarrow R^2 = 0.4248$

As seen, after June 2017 trend differ due to the devaluation of ruble that dropped its value by 32.7% in one overnight. This drastic decision was taken after the implementation of the free-trade agreement between EU and Moldova (EU–Moldova DCFTA) and the need of achieving a considerable level of competitiveness after the Ukrainian crisis and the increasing production cost of labour during 2014-16 and the first half of 2017.

Thanks to this devaluation the competitiveness goal was achieved, but due to some struggles and the endemic inflationary nature of the ruble forced the Transnistrian Republican Bank to re-adjust again from:

–   Until June 2017: 11.3 rubles per USD

–   June-November 2017: 15 rubles per USD → when the EU–Moldova DCFTA entered in force

–   November 2017-January 2018: 15.5 rubles per USD

–   From January 2018: around 16.1 rubles per USD

As seen in the European Union, when there is a fixed exchange rate the impossibility of devaluation forces the country to make an internal devaluation through wage reductions, increases of labour time or any increase in productivity that can mitigate the increase in cost.

During the 1990's in Germany some policies were applied to achieve competitiveness among its trade partners and thanks to that Germany is the leader in the European Union, in terms of labour competitiveness.

Burla's analysis was correct: *the growth of wages should be in direct dependence on the dynamics of labour productivity. It should be noted that, for several years, this correlation was absent.* Mainly healthiness of the labour market requires certain level of stability or an increase in wages related to the productivity.

An exhaustive analysis should be focused on the cost of uncontrollable migrations and the outsourcing cost that modify in few periods the whole trend of the ULC. Nevertheless, the hidden fact could be the high turnover of unskilled jobs that may lead to an increase in labour costs, derivate from this scarcity that increase costs in the less productive scales of the Pridnestrovian economy (for these cases it would be convenient to fulfil the labour demand of unskilled-seasonal jobs with non-permanent migration.

In the Pridnestrovian case the trend suggests that *ULC_USD* will stagnate thanks to the periodic adjustments of the ruble pegging. Even though, it will be very convenient to develop an anti-inflation policy, to achieve certain confidence with the ruble and to make payments to Pridnestrovian trade partners in the national currency. Although this idea is still far to be accomplished.

By the way, the most realistic propose that can be done in this case would be the retention of skilled population and promote the establishment of industry or technological services in Pridnestrovie by giving some fiscal advantages that could be financed, for example, by the increasing tourism in the region by stablishing a low visa fee (for those visitors without overnight) or might include the clause of having a certain minimum local population working on it. But these implications are more in the political side (as seen on 5th June 2018 in Tiraspol: 18 ambassadors visited Pridnestrovie in order to promote investment in the region and launch new diplomatic contacts[12]), rather than the pure economical one.

All in all, as statistical yearbooks prior to the crisis showed that the Pridnestrovian standard of living was higher than in Moldova and Ukraine. The kay factor might be the presence of the industrial sector in the North of the country that can claim, as Terzi suggested, skilled labour force to achieve a sustainable growth, that increases wages not because of underlying inflation, but because of productivity increases.

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[12] **Novosti Pridnestrovya** (2018). Ambassadors of 18 countries of the world visit Transnistria (*Послы 18 стран мира посещают Приднестровье – only available in Russian*). Tiraspol (Pridnestrovie) – consulted on: 14 June 2018 https://novostipmr.com/ru/news/18-06-05/delegaciya-poslov-evropeyskih-stran-poseshchaet-pridnestrove

DEVELOPING THE EFFICIENCY WAGES MODEL

The development and explanation of the of efficiency wage model will follow the same steps as David Romer (1996). This case, Romer used Summers' (1988) example and adapt it. Some basics are the following:

- There are N number of firms and L number of workers

- Firms' profit taken as production (revenues) less the cost of hiring workers and wages: $\pi = Y - wL$

- There is a direct relation between workers' effort and wages: $e = e(w)$

- Agents maximize their welfare:

    o Firms maximize production and minimize wage expenses: $\max_{L,w} F\left(e(w)L\right) - wL$

    o Workers maximize wages and minimize effort: $e = e(w)$ ; $e'(w) > 0$

- Optimum level of employment *(L\*)* may not be full employment *(u=0)*

At this point, both firm and worker maximize their function and get[13]:

$$\textbf{\textit{Firm}}: F'(e(w)L) = \frac{w}{e(w)} \qquad \textbf{\textit{Worker}}: \frac{we'(w)}{e(w)} = 1$$

Thus, firms maximize wages up to marginal cost equals the marginal labour product. While workers maximize their wage until the elasticity of the effort regarding the wage reaches 1 (known as the Solow condition). This efficiency is reached when wage increases by one basis point and effort increases by another one basis point. If not, the induction leads the optimum to readjust: if the one basis point increase of wage has less effect on effort, the wage will decrease (until equation and equilibrium holds) and if the effort grows in more than one basis point, then wage will keep increasing (until the equilibrium holds).

This idea proposed by Solow of the minimization of the effort has more theoretical application, rather than practical[14], even though, it is useful to consider than effort is stable over time (maybe to avoid the effect of other exogenous variables that may modify the model). Although in this paper it will be analysed the effect of this assumption, its implication and its consequences.

If this statement is correct, then, the optimum level of employment can be not full employment[15], since both maximizations affect the wage and Solow condition highlighted a certain level of unemployment.

In Romer's *"a more general efficiency wage model"* the effort is affected by the wage paid by the firm *(w)*, the wage of other firms *(w<sub>a</sub>)* and the unemployment level *(u)*. Being *w<sub>a</sub>* and *u* taken as given.

$$e = e(w, w_a, u); e'(w, w_a, u) > 0 \; ; e''(w, w_a, u) < 0; e'''(w, w_a, u) > 0$$

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[13] Main derivations of the model are exposed in Annex 1.

[14] As Krugman's critics to the New Growth Theory in the in *The New Growth Fizzle: "too much of it involved making assumptions about how unmeasurable things affected other unmeasurable things"* (New York Times – 2013)

[15] Full employment does not require, necessarily, u=0.00% but about 1.00% which is the estimated for Pridnestrovie (according to its statistical yearbooks prior to the Great Recession).

Then, after solving the maximization problem, again, the results give the Solow condition for workers and the optimal wage level as the market wage, reasonable since marginal costs equals marginal benefits.

$$\textbf{Firms}: F'(e(w, w_a, u)L) = \frac{w}{e(w, w_a, u)} \quad \textbf{Workers}: \frac{we'(w, w_a, u)}{e(w, w_a, u)} = 1 \rightarrow \textit{\textbf{\textcolor{red}{Solow condition}}}$$

Finally, by expanding the model it is given an example of how wages are affected by:

- $b$: how worried are workers on unemployment $\rightarrow b > 0$
- $\beta$: the elasticity of the effort respecting the wage premium $\rightarrow \beta \ni (0,1)$

The example used has the following formula that will be used to follow the analysis and the main relations that will be used to develop and analyse the evolution of wages and labour force during this period:

*Example of the model[16]:*

$$w > w_a(1 - bu)$$

$$e = \begin{cases} \left(\dfrac{w-x}{x}\right)^{\beta} & \rightarrow \ if \ w > x \\ 0 & \rightarrow \ x = (1-bu)w_a \end{cases}$$

$$\beta'_w = \frac{w}{e(w, w_a, u)} \cdot e'(w, w_a, u) = 1 \qquad \textit{Main relation:}$$

$$u = \frac{\beta}{b}$$

$$e = e(w, w_a, u) = \left[\frac{w - w_a(1 - bu)}{w_a(1 - bu)}\right]^{\beta}$$

$$\boxed{w = \frac{w_a(1 - bu)}{1 - \beta}}$$

All in all, the model has some implications that should be considered such as:

- Effort is fixed over time (that is not fixed it will be tested too)
- Employment in equilibrium is: $NL_{EQ} = (1 - u_{EQ})\bar{L}$ [17]
- Unemployment is not correlated over time

APPLYING THE EFFICIENCY WAGES MODEL

The main aim of this section is to determine the determine how concerned workers are regarding the possibility of being unemployed (level of concern). Thus, as it was shown in the development of Summers (1988) in Romer's, there is a relationship between the three variables shown in Summers model that may determine some basic characteristics of the behaviour of the Pridnestrovian labour market:

$$u \ (unemployment), b \ (level \ of \ concern), \beta \ (elasticity \ of \ the \ effort \ premium) \ \rightarrow \ u = {}^{\beta}\!/_{b}$$

According to the traditional development of this model, the effort is constant over time, since the effort level is always at the optimum level, according to the Solow condition. The tricky consideration of the effort as a fixed variable over time concerns the level of β, given the fact that it is a direct explanatory variable of it. Thus, in balanced effort is fixed *β* should be fixed. Then, the only variable that changeы over time may be *b*.

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[16] Here *x* is a measure of market conditions, as it is said in Romer's example.
[17] Firms hire L workers, in equilibrium.

$$e_{EQ} = \left( \frac{w_a - w_a \left(1 - b_{u_{EQ}}\right)}{w_a \left(1 - b_{u_{EQ}}\right)} \right)^{\beta} = \left( \frac{1 - \left(1 - b\left(\frac{\beta}{b}\right)\right)}{\left(1 - b\left(\frac{\beta}{b}\right)\right)} \right)^{\beta} = \left( \frac{\beta}{1 - \beta} \right)^{\beta}$$

To calculate *b*, the main procedure is to assign a fixed value to *β* and relate it with the unemployment. Nevertheless, the lack of data of unemployment per category makes this *b* estimation weak, due to *b* will be the same for all categories and it doesn't allow comparison among them.

$$u = \frac{\bar{\beta}}{b}; \; being \; \bar{\beta} \ni (0,1]; \; then \; b = \frac{\bar{\beta}}{u}$$

For any *β* all *b* follow the same trend that can be transformed into *b-value* (expressing *b*, previously a value over 0, as a number between 0 and 1) with the following formula:

$$b\text{--}value = \frac{b - minimum}{maximum}; \; being \; b\text{--}value \ni (0,1]$$

Minimum value at full employment (the lowest unemployment level prior to the Great Recession) and maximum at twice maximum historical unemployment record[18].

### Graph 2 — *b-value over time*
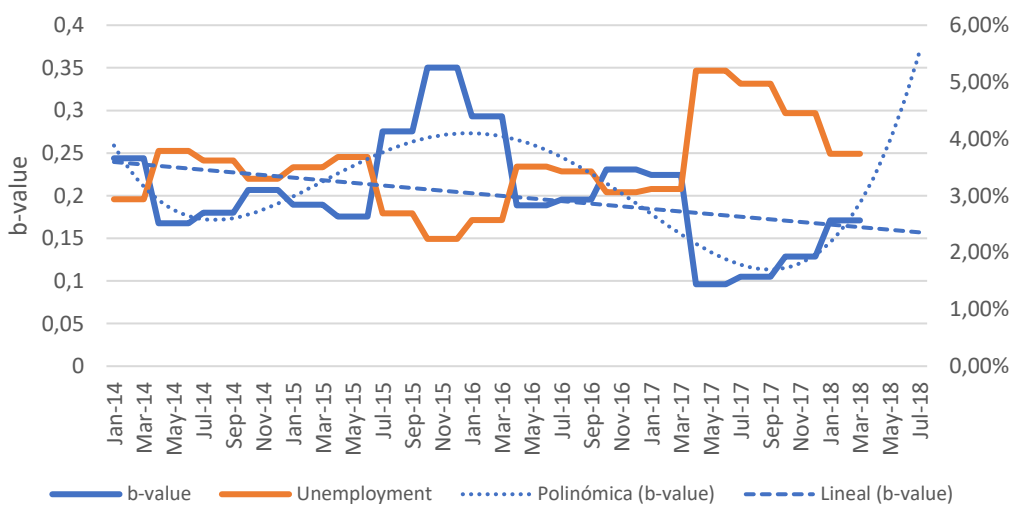


**2014**
- Jan-Mar: 0,244
- Apr-Jun: 0,168
- Jul-Sep: 0,180
- Oct-Dec: 0,207

**2015**
- Jan-Mar: 0,190
- Apr-Jun: 0,176
- Jul-Sep: 0,276
- Oct-Dec: 0,35

**2016**
- Jan-Mar: 0,293
- Apr-Jun: 0,189
- Jul-Sep: 0,195
- Oct-Dec: 0,231

**2017**
- Jan-Mar: 0,224
- Apr-Jun: 0,096
- Jul-Sep: 0,105
- Oct-Dec: 0,129

**2018**
- Jan-Mar: 0,171

Polynomial regression function:
$y = 10^{-6}x^4 - 10^{-4}x^3 + 0.0035x^2 - 0.0369x + 0.2925; \; \boldsymbol{R^2 = 0.625}$

Regression function linear: $y = -0.0015x + 0.2411; \; \boldsymbol{R^2 = 0.1258}$

---

[18] Being 5.2% the maximum between April and June 2017.

| $u = (0.00\%, 1.00\%)$ | $u = (0.00\%, 10.40\%)$ | $u = 10.40\%$ |
|---|---|---|
| $b-value = 0$ | $b-value = (0,1)$ | $b-value = 1$ |

A significant portion of the error of regressions is due to the lack of monthly unemployment data. Even though that *b-value* shows the concern of people regarding unemployment has been below 35% (peak in September-December 2015) for last post-crisis period, it is not clear how it will evolve over time. The estimations differ in its forecast. Notwithstanding, the most surprising fact is that *b-value*, estimated as Summers', has a negative correlation with unemployment. Therefore, this vacuum leads to the need of further research.

Although, because of the increasing in production costs (as seen in LUC analysis) it is possible that job safeness and job creation may stagnate, or even, became worse. In this scenario the preferences regarding: unemployment or inflation; of the Transnistrian Republican Bank will be crucial to determine the behaviour of *b-value* in future periods.

Essentially, Phillips' curve theory is based on this idea; therefore, it is not strange to relate the relative decrease of *b-value* during the last important depreciation in late May 2017 which result in an improvement of Pridnestrovian job safeness and an increase in competitiveness, while there was a significant decrease in general wealth.

A NEW TESTING OF THE *b-value*

As seen, when *b* is directly estimated by the equation: $u = \beta/b$; there was a negative correlation of how concern regarding the possibility of being unemployed and the unemployment rate. Thus, this time $\beta$ will not be considered as fixed variable. So, to calculate the function $unemployment - salary\ premium$ (developed in Annex 2) it will be used the concept of "the opportunity cost of being employed or unemployed".

Several variables that define wage premium, as well as workers' preferences, cannot be fully explained through this simple relationship, but the most relevant that can be taken is the monetary spread.

The original model shows two kinds of situations and based on these situations of full employment and unemployment optimum wage differ in their optimum:

- $L > L^*$ : firms can choose which wage to pay, so they pay $w$
- $L = L^*$ : firms must pay market salary, so they pay $w_a$

Therefore, *b* is a positive number that differs in each activity and its function is concave (when there is full employment there is no worry of being unemployed, because the market will absorb the worker, if fired, and in case of increasing unemployment concern increases into a relevant range).

As seen in Spain during the Great Recession, there is no need of having the whole active population unemployed, but concern may reach levels closed to 90% in workers (according to INE - 2013), because of unemployment does not only affect to their own job, but to the global socio-economic welfare of the country.

To determine the value b for each activity in the Pridnestrovian labour market there are some previous requirements that should be considered:

- Wage premium is calculated as the difference between the average monthly wage in each activity and: the average wage for all activities (Premium_av), the average unemployment benefit (Premium_ub) and the minimum subsistence amount (Premium_sb)

- Unemployment level is quarterly average for all categories (due to data is not available per category)

- Regression functions

    o $f(u) = wage\ premium\ \rightarrow$ the function follows a concave shape

    o Coefficient of determination required: $R^2 > 0.1$

    o The one with the highest $R^2$ is taken as for *b* calculation

    o *b* can be transformed into a 0-1 scale (that will be known as *b-value*)

    o Minimum and maximum values as previous estimation ($u = 1\%$ and $u = 10.4\%$)

Premium calculations and regression functions are taken after calculations shown in Annex 2. Here are all estimations, jointly with its coefficient of determination, which fulfilled all previous requirements:

- Industry: $y = 7990.5x^{0.1583}$
- Agriculture: $y = 5351.4x^{0.1935}$
- Railway: $y = 9650.6x^{0.2699}$
- Automotive: $y = 4444.8x^{0.1346}$
- Trolleybus: $y = 946.64x^{0.146}$
- Communication: $y = 9955.3x^{0.1166}$
- Postal: $y = -238.2\ln(x) - 2649.1$
- Electronic and radio: $y = 14049x^{0.1224}$

- Geology and meteorology: $y = 2517.5x^{0.1397}$
- Other XXXX: $y = 1817.9x^{0.16}$
- Editorial and publishers: $y = -747\ln(x) - 2043.4$ *(it follows a convex shape)*
- Healthcare: $y = 3198.7x^{0.102}$
- Social Security: $y = 2884.4x^{0.0738}$
- Education: $y = 10527x^{0.3361}$
- Preschool and basic: $y = 2773x^{0.0891}$

According to previous statistical yearbook records it has never been unemployment below 2% nor above 5.5%[19], nevertheless *b-value* function varies among previous range ($u \ni [1.00\%, 10.40\%]$) that will be used for the analysis. So, criteria to estimate b-value will be as previously shown:

$$b\text{–}value = \frac{b - minimum}{maximum};\ being\ b\text{–}value \ni (0,1]$$

As seen in Annex 2 and in graph 3 the behaviour of the *b-value*$_{previous}$ that was previously obtained through the equation $u = \beta/b$ differs, substantially, from results obtained, due to as correlation highlighted that there is a negative correlation coefficient between *b-value*$_{previous}$ and current b-values for the rest of categories. Nevertheless, editorial and publishers follow the same trend as *b-value*$_{previous}$ and this could indicate the presence of a hidden "convex" variable that inverts the tendency.

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[19] Unemployment defined as the amount of the active population which is able and willing to work but has no job.

Graph 3 — *b-value over time*
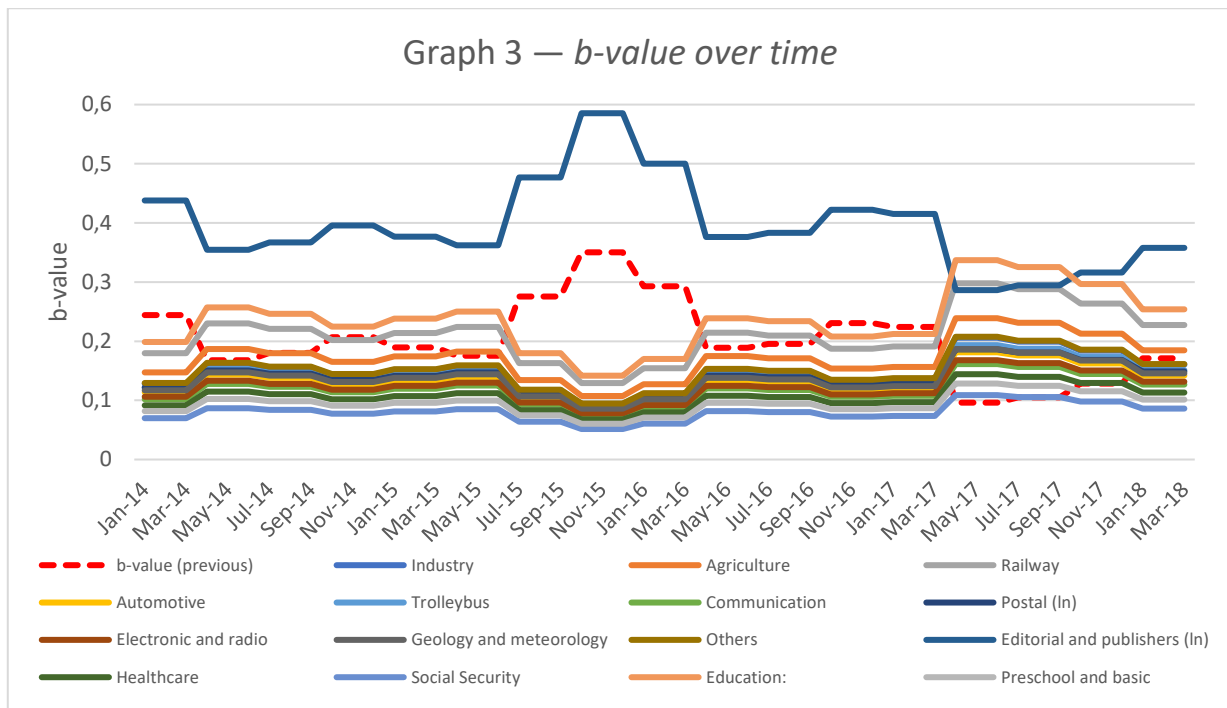
| | $\rho_{b-value,y}$ | $\rho_{industry,y}$ |
|---|---|---|
| Industry | -0,987 | --- |
| Agriculture | -0,986 | 1,000 |
| Railway | -0,984 | 1,000 |
| Automotive | -0,987 | 1,000 |
| Trolleybus | -0,987 | 1,000 |
| Communication | -0,988 | 1,000 |
| Postal (ln) | -0,990 | 1,000 |
| Electronic and radio | -0,987 | 1,000 |
| Geology and meteorology | -0,987 | 1,000 |
| Others | -0,987 | 1,000 |
| Editorial and publishers[20] (ln) | 0,995 | -0,966 |
| Healthcare | -0,988 | 1,000 |
| Social Security | -0,989 | 1,000 |
| Education | -0,982 | 1,000 |
| Preschool and basic | -0,988 | 1,000 |

These differences have no connection with potential nor logarithmic functions (due to both follow concave shape), but with the data nature itself.

From these *b-values* which are opposite to the original *b-value*$_{previous}$ derive some implications:

– *b-value* is not the same for all categories
– *b-value* follows an "almost" identical trend among categories
– there is the existence of underlying risk of being unemployed in each category
– *"hidden convex function"* categories influence the behaviour of *b-value*$_{previous}$

One of the most interesting implications is the mismatch with *β*, due to these alterations is the need to be flexible over time (see table 1 in Annex 2). This is one of the strongest reasons to consider it as a fixed variable: to avoid the effect of exogenous variables that could interfere on the model, as happened.

If unemployment level flow trends were erased from the analysis of each category (taking any of them as the main comparison, due to the strong correlation → $\rho \approx 1$) then, the systematic risk of being unemployed per category would arise. Even though, it is not as easy as a simple calculation and it includes several factors that are out of the job safeness (guaranteed by the country) but with mechanization, obsolescence or substitution of labour activity in the future.

---

[20] This is the only function which convex shape. This is the reason for this strong correlation with *b-value*$_{previous}$.

As studied by Burla in *"Statistical analysis of the dynamics of value, inter-branch and territorial differences of earning costs in the Transnistrian region"* (2015) the trends in the labour market were clearly different among sectors in Pridnestrovie, but as seen in the *b-value* analysis agriculture is the worst paid and one with higher levels of *b-value* (meaning that the probability of being fired is higher than in other activities). This makes its jobs unattractive for nationals and, as studied in the migration publications, these positions are mainly held by immigrants coming from less developed countries.

Nevertheless, the case of Social Security is the opposite: low wages but less chances of being unemployed, due to its *b-value* (the lowest in Pridnestrovian economy). This job could be competitive because of its life-time implications that can take it as a perpetuity, because of the job is guaranteed by the local government and it is usually for lifetime.

It will be convenient to analyse the effect of the *b-value* and wages in best paid categories[21], but data is not consistent to make an analysis regarding this situation. As a remark, jobs with the better wage level did not fit in the *b-value* analysis, even though, banking, insurance or manufacturing are activities with a high degree of synchronization with foreign economies. And, as seen in the case of *Editorial and publishers* category, their *b-value* estimating functions are convex then:

- High wage categories b-value functions are convex
- High wage categories follow *b-value$_{previous}$* trend[22]
- High wage categories have strong and positive correlation with *Editorial and publishers* category

From these results it is plausible to assure that *b-value$_{previous}$* follow a convex shape that defines the risk or concern of being unemployed.

COMPARISON AND IMPLICATIONS

As seen with the case of Industry and other convex categories, there is an implicit magnification effect in each *b-value* (per categories) that combines both risks of being unemployed: the risk derivate from the national economy situation and the risk related to the nature of the job itself.

$$b\text{–}value = \overline{b\text{–}value_{primary}{}^{23}} \cdot [1 + job\ nature\ risk] + \varepsilon$$

This relationship applies to convex categories too, although unemployment correlation was negative, and the magnification effect would lead to an extreme *b-value* (in convex categories) while unemployment decreases, as it happens when the Summers' (1988) relationship: $u = \beta/b$; was applied.

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[21] According to Burla (2015) best paid categories were: electricity, telecommunications, banking, insurance, manufacturing, construction and science. In any of them *b-value* calculation was possible.
[22] Otherwise *b-value$_{previous}$* will not be that strongly correlated with concave categories and shape will disappear.
[23] Not fixed over time but fixed among categories.

To solve this mismatch among categories and, as a result, obtain an average *b-value* for whole Pridnestrovian market will take time, data which is not currently available and a significant error amount if calculated as a single category, due to it will include the "primary *b-value*" $\rightarrow b\text{-}value_{primary}$ and a distortion due to the job nature risk of all jobs in Pridnestrovie.

That is why it is better to analyse two convex categories with a significant determination coefficient (the highest) and erase the effect of the job nature to get $\overline{b\text{-}value_{primary}}$ as a fixed and universal value for Pridnestrovie, but also a risk-free category which is only sensitive to the national economic situation.

Healthcare (with $R^2 = 0.4178$) and Automotive ($R^2 = 0.3954$) are the categories with the most significant regressions and the safest job being Social Security (because of its historical low b-value) taken as risk-free, therefore, after the analysis shown in Annex 2 showed a strong correlation[24] between Social Security, Healthcare and Automotive, therefore the basic $\overline{b\text{-}value_{primary}}$ is simply the Social Security b-value plus an undefined error term:

$$\overline{b\text{-}value_{primary}} = b\text{-}value_{Social\ Security} \cdot \left[1 + 0\%^{25}\right] + \varepsilon = b\text{-}value_{Social\ Security} + \varepsilon$$

### Table 1 – $b\text{-}value_{primary}$ (basic for all categories)

|  | 1,0% | 1,5% | 2,0% | 2,5% | 3,0% | 3,5% | 4,0% | 4,5% | 5,0% | 5,5% | 6,0% | 6,5% | 7,0% | 7,5% | 8,0% | 8,5% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Social Security | 0,000 | 0,030 | 0,051 | 0,068 | 0,081 | 0,092 | 0,102 | 0,111 | 0,119 | 0,126 | 0,132 | 0,138 | 0,144 | 0,149 | 0,153 | 0,158 |

As the error term is not quantifiable, because of the lack of data per category (it correlates the whole unemployment level with b-value and not with $u_{category}$) and the constraint that suppose to analyse periods in bundles of three months, as given in the statistical reports, here it will be given the basic relationship, without tanking into account the error term, that relates the volatility of all jobs respect to the Social Security.

### Table 2 – *Job nature risk per category*

| Industry | Agriculture | Railway | Automotive | Trolleybus | Communication | Postal (In) | Electronic and radio | Geology and meteorology | Others | Healthcare | Education | Preschool and basic |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 114,50% | 162,20% | 265,72% | 82,38% | 97,83% | 57,99% | 101,73% | 65,85% | 89,30% | 116,80% | 38,21% | 355,42% | 20,73% |

All these job nature risks per category include several aspects such as follow:

$$Job\ nature\ risk = obsolescence + natural\ population\ growth + technologic\ risk + etc.$$

---

[24] $\rho = 1$ Because the unemployment among categories is not available, otherwise it might differ.
[25] Due to it is taken as the risk-free category.

Therefore, there is not a direct correlation among nor inside them necessarily, but as a previous approach (without any further analysis and with available data) there are some cases that can be explained by using logics, such as Education which depends on the evolution of the population and, as exposed by the studies of Volkova, Ostavnaya and Terzi they all agree and conclude that after post-crisis migrations that decreased the population by 10% in 2009-10 there is a need, as forecasted by the Government, to increase young population and mitigate the decrease in the rate of natural increase that strongly affects to the education job nature risk.

Turnover, as in Terzi's (2011) for unskilled job positions is significantly lower than for skilled ones. Nevertheless, categories such as: Industry (skilled and unskilled), Automotive (skilled and unskilled), Trolleybus (skilled), Communication (skilled), Electronic and radio (skilled), Geology and meteorology (skilled), Other XX, Healthcare (skilled) and Preschool and basic (skilled and unskilled) have low job risk than Agriculture (unskilled). Therefore, as seen in the previous analysis, regarding Agriculture in A NEW TESTING OF THE *b-value*, there is a structural problem that should be solved with the risk and uncertainty in this concrete sector.

RESULTS OF THE NEW *b-value* ANALYSIS

After analysing the *b-values* and identifying the main causes of divergence among categories, it is plausible to correlate the high labour force mobility and the wage flexibility in Pridnestrovie to "relative" low unemployment levels, which are floating around 3.00%-5.00% for whole post-crisis periods.

Nevertheless, it has been causing a serious impact in the structure of the Pridnestrovian population and, as seen in the study of Terzi (2013), there is an imperious need to solve the financial issues and to improve the current account balance by promoting the industrial and high-skilled sectors.

After b-value calculations, it was shown that $\beta$ was not a fixed value, but correlated with any exogenous variable that, in this case, it is unemployment (in contradiction what Summers' example shown). Therefore, as in the case of the Industry is shown, when was or not convenient to adjust wages when unemployment was below 3%, therefore this shows a considerable amount of working population willing to accept a lower wage, in case of a sudden increase of unemployment level. Even though, in any case this analysis can be taken fully in consideration because of the data bias.

Governmental plans should be focused on the reduction in labour uncertainty by identifying the main sources of risk, jointly with a more developed analysis of the *b-value* that can be helpful to determine which positions can be more easily improved, because the current situation in Industry, for example, is quite healthy and few reforms may lead to reduce the outstanding risk and achieve economies of scale (as in Ribnitsa mining).

All in all, there was and there is a good and a bad effect of the devaluation of 2017: it reduces unemployment, but it affected strongly to some international activities, despite of the effect in concave categories was not very significant, overall.
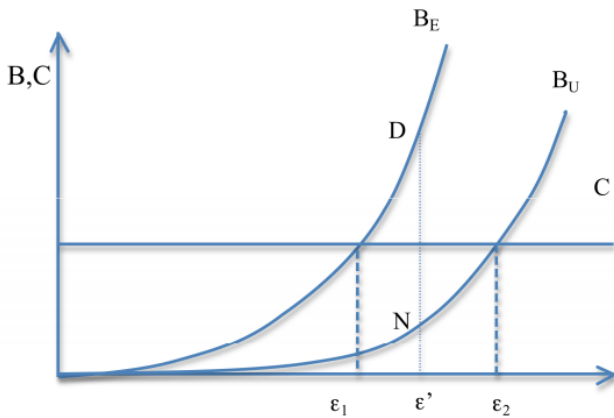
SECOND-GENERATION MODELS OF CURRENCY CRISIS



Figure 5.2: Multiple equilibria in foreign exchange market

These second-generation models were developed by Obstfeld (1986) after Krugman's (1979) first-generation model which was stablishing the optimum point to devaluate when the shock on the fixed exchanged rate was above the costs of devaluating:

$$\varepsilon_1 \to C > B; \text{ then devaluate}$$

Nevertheless, in Obstfeld (1986) the expectations of customers were introduced, therefore there is a space in between that allows the Transnistrian Republican Bank to have a pegging even when situation, in terms of reserves is not enough nor sustainable.

The main implication of it is the range where this is possible, where the Benefit curve of devaluating differs when agents expect ($B_E$) or not ($B_U$) the devaluation of the national currency.

In case of $\varepsilon'$, when agents expect a devaluation, the system is vulnerable to speculative attacks, therefore, as happened in Pridnestrovie before June 2017, there was a situation in which the range was not clearly defined, because of last devaluation was done several years ago and it was not in mind. Thus, when it reached $\varepsilon_2$ the Transnistrian Republican Bank had no other choice to devaluate, by causing a 32.7% of decrease in the ruble value towards the United State dollar.

So, knowing if agents expect or not the devaluation is crucial to calibrate and know when to react, nevertheless this model is rather theoretical than practice, but as seen in the *b-value* analysis, the wage adjustment is "almost" always the better choice, since there is a persistent gap in wages and Pridnestrovian wages are not as inelastic as predicted.



Graph 4 — *Index evolution since 2014*
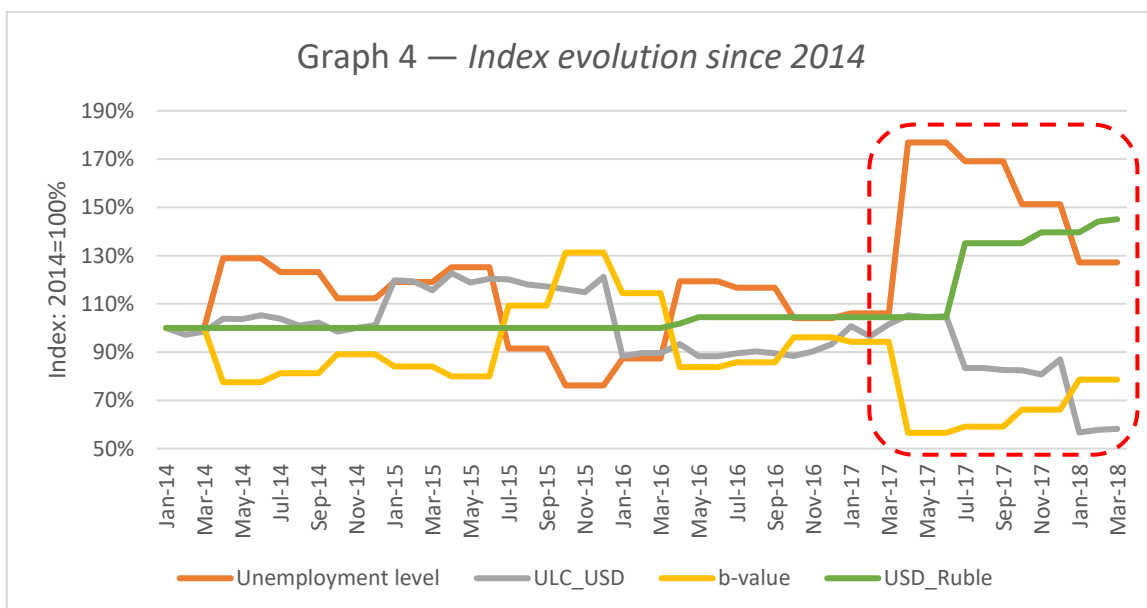
IMPLICATIONS OF THE MODEL AND ANALYSIS OF THE RESULTS

After the development of ULC, Summers' (1988) model and the application of second-generation models of currency crisis there are some relationships that are clear:

- Unemployment level is strongly negative correlated with b-value → $\rho = -0.96$
- ULC (in USD) and the ruble exchange rate have a negative correlation → $\rho = -0.75$
- Sudden increases in unemployment lead to an unavoidable peg rearrangement (hence to ULC too)

The main idea of this paper was to quantify the impact of the last shock (occurred in June 2017) and try to forecast or provide a possible solution to the mismatch of macroeconomic variables.

The lack of data, per labour category, quarterly unemployment reports and a not very developed demoscopic statistical service may put some troubles to set the correct analysis to know when the right time is to adjust salaries and move forward to a needed adjust, rather than to deal with chronical inflation and having the need of devaluating again.

In another perspective, the politico-economic situation in the region affects, for sure, to the last economical events, as the enforcement free trade agreement between Moldova and the EU (in January 2017) Prid-nestrovie faced a new complex scenario never lived before. Clearly the last year had a big impact on the trends of all macroeconomic variables, because of this free-trade agreement. Nevertheless, is not easily quantifiable but for further analysis it might be taken into consideration the coordination degree of the Prid-nestrovian economy with Moldova, Ukraine, Belarus, Russia (the countries with more migratory influx and with more similarities in the labour market) and the EU, plus the structural differences among them.

Pridnestrovie is taking out risks by acquiring the Russian legislation[26], promoting foreign investment and giv-ing incentives to skilled newcomers into its boundaries. Although, the effectiveness of these policies is only visible in the long run, there is a need of keeping ULC in low levels until productivity increases in real terms.

Inflation and migration are relatively low for Spanish standards, nevertheless in terms of a small economy such as Pridnestrovie is crucial to adjust and move further the needed optimum to not have surprises as it happened in 2017 when situation was unsustainable.

If ULC stabilize and the governmental plan of catching new investment and high-skill jobs succeeds there is no doubt that Pridnestrovian labour market will be as competitive as it was prior to the crisis.

In conclusion, this previous analysis forecasted, as accurate as possible, the impact of last 4 years macroeco-nomic shocks and the only main implication that can be extracted is not to abuse of inflation, because of *Seignoriage* can keep wages low, but the vicious circle of devaluations may destroy the whole tendency and completely mismatch all macroeconomic variables.

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[26] RG - Transnistria will heal according to Russian laws. Consulted on: 14 June 2018 https://rg.ru/2013/12/25/pmr-s.html

## Bibliography

**International Monetary Fund** (2018). *World Economic Outlook Database*. Washington D.C. (USA): International Monetary Fund. Consulted on: 14 June 2018, http://www.imf.org/external/pubs/ft/weo/2018/01/weodata/index.aspx

**Krueger**, A. and **Summers**, L. (1988). *Efficiency Wages and the Inter-Industry Wage Structure.* Hoboken (USA): Econometrica, vol. 56, num. 2, 259-294. ISSN: 0012-9682

**Romer**, D. (1996). *Advanced macroeconomics* (1st edition). New York (USA): McGraw-Hill. ISBN: 0-07-0536678

**Sabor**, I. (2012). *Economic viability under frozen conflict: "The Island of Transnistria"*. Oslo (Norway): University of Oslo. Consulted on: 14 June 2018, https://www.duo.uio.no/bitstream/handle/10852/13411/Sabor-Master.pdf%3Fsequence%3D2

**State Statistical Service** – Государственная служба статистики (2018). *Information – Информация* (only available in Russian). Tiraspol (Pridnestrovie): Ministry of the economic development – Министерство экономического развития. Consulted on: 14 June 2018, http://mer.gospmr.org/gosudarstvennaya-sluzhba-statistiki/informacziya.html

**Summers**, L. (1988). *Relative Wages, Efficiency Wages, and Keynesian Unemployment*. Pittsburgh (USA): American Economic Review, vol. 78, num. 2, 383-388. ISSN: 0002-8282

**Obstfeld**, M. (1986). Rational and self-fulfilling balance-of-payments crises. Pittsburgh (USA): American Economic Review, vol. 76, num. 2, 72–81. ISSN: 0002-8282

## Related works

**Burla**, M.P. (2015). *"Statistical analysis of the dynamics of value, inter-branch and territorial differences of earning costs in the Transnistrian region" – Статистический анализ динамики величины, межотраслевых и территориальных различий заработной платы в Приднестровском регионе* (only available in Russian). Kharkov (Ukraine): Problems of Continuous Geographical Education and Cartography, num. 22, 33-36. ISSN: 2409-3173. УДК 349.232(478.9)

**Smolenskiy**, N.N (2007). *Demographic situation and migration situation in the Pridnestrovian Moldavian Republic, their influence on the formation of the regional labor market – Демографическая обстановка и миграционная ситуация в Приднестровской Молдавской Республике, их влияние на формирование регионального рынка труда*. Moscow (Russia): Labor and social relations, num 6. ISSN 2073-7815

**Fomenko**, V.G. and **Krivenko**, A.V. (2011). *"Economic-geographical aspects of labour migration of the population of the Moldovan region of Transnistria"* – Экономико-географические аспекты трудовой миграции населения Приднестровского региона Молдовы (only available in Russian). Kiev (Ukraine): Special. Regional development of Ukraine: problems and perspectives (KNEU), chapter 2, 293-301. УДК 331.556.4 (478.9).

**Onilova**, N.E. (2006). *"Pridnestrovian Labour Market"* – Рынок Труда Приднестровья (only available in Russian). Moscow (Russia): Living standards of the population of the regions of Russia, num. 8, 38-43. ISSN: 1999-9836

**Ostavnaya** A.N., **Volkova** O.A. and **Bystryantsev** S.B. (2015). *"The prospects of social policy in the sphere of labour migration in Transnistrian region"* – Перспективы социальной политики в сфере трудовой миграции Приднестровья (only available in Russian). Saint Petersburg (Russia): Sociology and Law (СПбУТУиЭ), num. 3 (29), 35-43. ISSN: 2219-6242. УДК: 331.556

**Terzi**, N.V. (2011). *"Problems of employment and unemployment in the Pridnestrovian Moldavian Republic"* – Проблемы занятости и безработицы в Приднестровской Молдавской Республике (only available in Russian). Moscow (Russia): Economic Relations (Creative Economic), vol. 1, num. 2, 22-27. ISSN: 2587-8921

**Terzi**, N.V. (2013). *"Peculiarities of social and economic policy in the Pridnestrovian Moldavian Republic"* – Особенности социально-экономической политики в Приднестровской Молдавской Республике (only available in Russian). Russia: Business in law. Economic and legal journal, vol. 1, 237-240. ISSN: 2310-7030

**Terzi**, N.V. (2013). *"Ways of management of processes of formation of competitive labour force in Pridnestrovie in the conditions of transition to the innovation economy"* – Пути управления процессами формирования конкурентоспособной рабочей силы в Приднестровье в условиях перехода к инновационной экономике (only available in Russian). Russia: Business in law. Economic and legal journal, vol. 5, 297-300. ISSN: 2310-7030

**Terzi**, N.V. and **Terzi**, D.V. (2014). *"The peculiarity of forming qualificational and intellectual labour market (based on the materials of the Pridnestrovian Moldavian Republic)"* – Особенности формирования рынка квалифицированного и интеллектуального труда (по материалам Приднестровской Молдавской Республики) (only available in Russian). Barnaul (Russia): Bulletin of the Altai academy of economics and law, num. 1 (33), 59-61. ISSN: 2226-3977

**Volkova**, O.A. and **Ostavnaya**, A.N. (2014). *"Transnistrian labour migration: strokes to potential social policy"* – Приднестровская трудовая миграция: штрихи к потенциальной социальной политике (only available in Russian). Volgograd (Russia): Bulletin of Volgograd State University, vol. 7, Philosophy – 2014, num. 5 (25), 43-59. УДК 316.444. ISSN: 2408-9478

**Volkova**, O.A., **Ostavnaya**, A.N. and **Zamaletdinova**, L.R. (2015). *"Trans-Dniester labour migrants on the territory of recipient country: quality of life and employment"* – *Приднестровские трудовые мигранты на территории страны-реципиента: качество жизни и особенности занятости* (only available in Russian). Kazan (Russia): Bulletin of Economics, Law and Sociology, num. 3, 251-255. УДК 331.556.4. ISSN: 1998-5533

## Figure index

## Acknowledgements

## Annex 1 – Model derivations

Here are shown all derivations needed for the generic efficiency-wage model:

$$\pi = Y - wL$$

$$Y = F(eL)$$

$$F'(eL) > 0 \; ; \; F''(eL) < 0$$

$$e = e(w) \; ; \; e'(w) > 0$$

$$\max_{L,w} F\left(e(w)L\right) - wL$$

$$F'(e(w)L)e(w) - w = 0 \; ; F'(e(w)L)Le'(w) - L = 0$$

$$F'(e(w)L) = \frac{w}{e(w)}$$

$$\frac{we'(w)}{e(w)} = 1$$

$$e = e(w, w_a, u); e'(w, w_a, u) > 0 \; ; e''(w, w_a, u) < 0; e'''(w, w_a, u) > 0$$

$$F'(e(w, w_a, u)L) = \frac{w}{e(w, w_a, u)}$$

$$\frac{we'(w, w_a, u)}{e(w, w_a, u)} = 1$$

$$e = \begin{cases} \left(\dfrac{w - x}{x}\right)^{\beta} & \to \;\; if \; w > x \\ 0 & \to \;\; x = (1 - bu)w_a \end{cases}$$

$$e = e(w, w_a, u) = \left[\frac{w - w_a(1 - bu)}{w_a(1 - bu)}\right]^{\beta}$$

$$w > w_a(1 - bu)$$

$$\beta'_{w} = \frac{w}{e(w, w_a, u)} \cdot e'(w, w_a, u) = 1$$

$$\beta'_{w} = \frac{w}{\left[\dfrac{w - w_a(1 - bu)}{w_a(1 - bu)}\right]^{\beta}} \cdot \beta \left[\frac{w - w_a(1 - bu)}{w_a(1 - bu)}\right]^{(\beta - 1)} \cdot \frac{1}{w_a(1 - bu)} = 1$$

$$w\beta \cdot \left[\frac{w - w_a(1 - bu)}{w_a(1 - bu)}\right]^{(\beta - 1 - \beta)} \cdot \frac{1}{w_a(1 - bu)} = w\beta \cdot \left[\frac{w - w_a(1 - bu)}{w_a(1 - bu)}\right]^{-1} \cdot \frac{1}{w_a(1 - bu)} = 1$$

$$w\beta \cdot \left[\frac{w_a(1 - bu)}{w - w_a(1 - bu)}\right] \cdot \frac{1}{w_a(1 - bu)} = w\beta \cdot \frac{1}{w - w_a(1 - bu)} = 1$$

$$w\beta = w - w_a(1 - bu)$$

$$w - w\beta = w(1 - \beta) = w_a(1 - bu)$$

$$w = \frac{w_a(1 - bu)}{1 - \beta}$$

$$if\ \beta\ is\ small\ then:\ \frac{1}{1 + \beta} = 1 + \beta$$

$$u = \frac{\beta}{b}$$

Cost of no adjustment

$$C_{NAdj} = \frac{w_a}{e(w, w_a, u)}$$

$$C_{NAdj} = \frac{w_a}{\left[\frac{w - w_a(1 - bu)}{w_a(1 - bu)}\right]^{\beta}} = \frac{w_a}{\left[\frac{buw_a}{w_a(1 - bu)}\right]^{\beta}} = \frac{w_a}{\left[\frac{bu}{(1 - bu)}\right]^{\beta}} = w_a \left[\frac{1 - bu}{bu}\right]^{\beta}$$

Cost of adjustment

$$C_{ADJ} = \frac{w}{\left[\frac{w - w_a(1 - bu)}{w_a(1 - bu)}\right]^{\beta}} = \frac{\frac{w_a(1 - bu)}{1 - \beta}}{\left[\frac{\frac{w_a(1 - bu)}{1 - \beta} - w_a(1 - bu)}{w_a(1 - bu)}\right]^{\beta}} = \frac{\frac{w_a(1 - bu)}{1 - \beta}}{\left[\frac{w_a(1 - bu) - w_a(1 - bu)(1 - \beta)}{w_a(1 - bu)}\right]^{\beta}} =$$

$$= \frac{\frac{w_a(1 - bu)}{1 - \beta}}{\left[\frac{\{w_a(1 - bu)\}\{1 - 1 + \beta\}}{w_a(1 - bu)}\right]^{\beta}} = \frac{\frac{w_a(1 - bu)}{1 - \beta}}{[\beta]^{\beta}} = \frac{w_a(1 - bu)}{(1 - \beta)\beta^{\beta}}$$

## Annex 2 – Unemployment – Wage premium calculations

Here is shown all calculations as defined in: APPLYING THE EFFICIENCY WAGES MODEL; nevertheless, as an example, due to the extension of the whole calculations required.

To simplify calculations and make the possible for further analysis functions are shown as: $f(x) = y$ and not as: $f(u) = wage\ premium$, even though, $x = u$ and $y = wage\ premium$.

**Industry**



Industry - *b calculation*

| Premium as: **Premium_av** | Premium as: **Premium_sb** | Premium as: **Premium_ub** |
|:---:|:---:|:---:|
| $w - \overline{w}\ (average\ wage)$ | $w - subsistence\ level$ | $w - unemployment\ benefits$ |
| $y = 4008.6\ x^{0.3664}$ | $y = 7990.5\ x^{0.1583}$ | $y = 6602.7\ x^{0.1483}$ |
| $R^2 = 0.1644$ | $R^2 = 0.2088$ | $R^2 = 0.1535$ |

The potential regression line with the highest level of accuracy of both wage premium calculation is **Premium_sb**. Therefore, its derivative is used for elasticity calculations.

Categories to analyse were the following, according to the division of the Statistical Yearbook of the Pridnestrovian Statistical Service:

*Industry, Agriculture, Forestry, Transport, Railway (including: Automotive, Trolleybus and Others), Communication (including: Postal and Electronic), Building (including: Construction), Trade and catering, Geology and meteorology, Others (including: Editorial and publishers), Housing and utilities, Nonprofits of household services, Healthcare, Social security, Education (Higher education, Specialized secondary and Preschool and basic), Culture and art, Physical, culture, recreation and tourism, Science and scientific, Banking, Insurance, Public security, Judicial body and Administration of the Republic.*

Table showing all b-value for each unemployment level per category (but only the ones with $R^2 > 0.1$):

### Table 1 – *b-value for each unemployment level*

| | 0-1% | 1.5% | 2% | 2.5% | 3% | 3.5% | 4% | 4.5% | 5% | 5.5% | 6% | 6.5% | 7% | 7.5% | 8% | 8.5% | 9% | 9.5% | 10% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **All categories** | 0.00 | 0.17 | 0.29 | 0.39 | 0.47 | 0.53 | 0.59 | 0.64 | 0.68 | 0.73 | 0.76 | 0.80 | 0.83 | 0.86 | 0.88 | 0.91 | 0.93 | 0.96 | 0.98 |
| Industry | 0.00 | 0.06 | 0.11 | 0.15 | 0.17 | 0.20 | 0.22 | 0.24 | 0.25 | 0.27 | 0.28 | 0.30 | 0.31 | 0.32 | 0.33 | 0.34 | 0.35 | 0.36 | 0.36 |
| Agriculture | 0.00 | 0.08 | 0.13 | 0.18 | 0.21 | 0.24 | 0.27 | 0.29 | 0.31 | 0.33 | 0.35 | 0.36 | 0.38 | 0.39 | 0.40 | 0.41 | 0.43 | 0.44 | 0.45 |
| Railway | 0.00 | 0.11 | 0.19 | 0.25 | 0.30 | 0.34 | 0.37 | 0.41 | 0.43 | 0.46 | 0.48 | 0.51 | 0.53 | 0.54 | 0.56 | 0.58 | 0.59 | 0.61 | 0.62 |
| Automotive | 0.00 | 0.05 | 0.09 | 0.12 | 0.15 | 0.17 | 0.19 | 0.20 | 0.22 | 0.23 | 0.24 | 0.25 | 0.26 | 0.27 | 0.28 | 0.29 | 0.30 | 0.30 | 0.31 |
| Trolleybus | 0.00 | 0.06 | 0.10 | 0.13 | 0.16 | 0.18 | 0.20 | 0.22 | 0.23 | 0.25 | 0.26 | 0.27 | 0.28 | 0.29 | 0.30 | 0.31 | 0.32 | 0.33 | 0.34 |
| Communication | 0.00 | 0.05 | 0.08 | 0.11 | 0.13 | 0.15 | 0.16 | 0.18 | 0.19 | 0.20 | 0.21 | 0.22 | 0.23 | 0.23 | 0.24 | 0.25 | 0.26 | 0.26 | 0.27 |
| *Postal (ln)* | *0.00* | *0.06* | *0.10* | *0.13* | *0.16* | *0.18* | *0.19* | *0.21* | *0.22* | *0.23* | *0.24* | *0.25* | *0.26* | *0.27* | *0.28* | *0.28* | *0.29* | *0.30* | *0.30* |
| Electronic and radio | 0.00 | 0.05 | 0.08 | 0.11 | 0.13 | 0.15 | 0.17 | 0.18 | 0.20 | 0.21 | 0.22 | 0.23 | 0.24 | 0.25 | 0.25 | 0.26 | 0.27 | 0.28 | 0.28 |
| Geology and meteorology | 0.00 | 0.06 | 0.10 | 0.13 | 0.15 | 0.18 | 0.19 | 0.21 | 0.22 | 0.24 | 0.25 | 0.26 | 0.27 | 0.28 | 0.29 | 0.30 | 0.31 | 0.31 | 0.32 |
| Other | 0.00 | 0.06 | 0.11 | 0.15 | 0.18 | 0.20 | 0.22 | 0.24 | 0.26 | 0.27 | 0.29 | 0.30 | 0.31 | 0.32 | 0.33 | 0.34 | 0.35 | 0.36 | 0.37 |
| *Editorial and publishers (ln)* | *0.00* | *0.01* | *0.01* | *0.01* | *0.01* | *0.02* | *0.02* | *0.02* | *0.02* | *0.02* | *0.02* | *0.02* | *0.02* | *0.03* | *0.03* | *0.03* | *0.03* | *0.03* | *0.03* |
| Healthcare | 0.00 | 0.04 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 | 0.15 | 0.16 | 0.17 | 0.18 | 0.19 | 0.20 | 0.21 | 0.21 | 0.22 | 0.22 | 0.23 | 0.23 |
| Social Security | 0.00 | 0.03 | 0.05 | 0.07 | 0.08 | 0.09 | 0.10 | 0.11 | 0.12 | 0.13 | 0.13 | 0.14 | 0.14 | 0.15 | 0.15 | 0.16 | 0.16 | 0.17 | 0.17 |
| Education | 0.00 | 0.14 | 0.23 | 0.31 | 0.37 | 0.42 | 0.47 | 0.51 | 0.54 | 0.57 | 0.60 | 0.63 | 0.65 | 0.68 | 0.70 | 0.72 | 0.74 | 0.76 | 0.77 |
| Preschool and basic | 0.00 | 0.04 | 0.06 | 0.08 | 0.10 | 0.11 | 0.12 | 0.13 | 0.14 | 0.15 | 0.16 | 0.17 | 0.17 | 0.18 | 0.19 | 0.19 | 0.20 | 0.20 | 0.21 |



Graph A2.1 — *b-value over time*

## Graph A2.2 — *b-value functions given ceirtan unemployment level*



## Graph A2.3 — *b-values and predictions*