



Gateway Blueprint Model Workshop 2005 *Effective Public Investment in the St. Louis Region: “More for Your Money”*

Todd Bendor and Saket Sarraf

June 2005

Abstract:

The LEAM group has begun exploring the feasibility of modeling social and racial equality issues in the St. Louis region. In the 2001 FOCUS St. Louis report, “Racial Equality in the St. Louis Region: A Community Call to Action,” the state of racial equality in the St. Louis region was examined. We attempt to recreate the conceptual model of socio-economic (economics, housing, and education) disparities laid out in the report in a more explicit manner using a tool known as “causal loop diagrams”. However, it is important to translate these conceptual models into more quantified versions. The STELLA modeling platform was used to outline broad initial possibilities for the creation of rigorous quantitative models of the system outlined in the FOCUS St. Louis report. The next steps of this modeling exercise will involve 1) further refining the model’s intentions and scope, 2) identifying and gather data available for the model, 3) testing the implementation of the model, and 4) presenting to the East-West Gateway for feedback.



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries



Gateway Blueprint Model Workshop 2005

Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Introduction

In October 2004, the LEAM group began exploring the feasibility of modeling social and racial equality issues in the St. Louis region at the request of the East-West Gateway's Department of Policy and Programming Staff in support of their work for the Metropolitan Forum. Work on this topic is intended to supplement ongoing modeling work projecting land-use change in the region. We began with conceptual modeling of several issues surrounding the structure and dynamics of wealth inheritance, acquisition, and loss. This conceptual model was then translated into a more quantitative computer modeling environment known as STELLA, whereby plans were made for further exploration modeling social inequality issues in the St. Louis region. This summary details the literature used to support the conceptual and initial quantitative models, explains the modeling that has been completed to date, and describes the next steps to implement this quantitative model.

Background

In 2001, FOCUS St. Louis released a report studying the state of racial equality in the St. Louis region entitled, "Racial Equality in the St. Louis Region: A Community Call to Action." This report concludes that, while improvements have been made over the last decade, racial equality remains an important and divisive issue in the St. Louis region. Here, the focus falls on three broad areas, including economics, housing, and education. While creating a broad conceptual model of the inner-workings of wealth transfer in society, the report's narrative summarizes eighteen months of data collection for the St. Louis area. Attempts were made to recreate this conceptual model in a more explicit manner using a tool known as "causal loop diagrams" (also known as, "causal maps"). These diagrams, used extensively in systems modeling, attempt to construct direct cause and effect relationships between variables in a given system. Here, cause and effect is delineated by the *direction* of impact of one variable on another. If variables change in the same direction (e.g. nutrition and health), the relationship is denoted with a '+' sign. The relationship between variables that change in opposite directions (e.g. pollution and environmental quality) is denoted with a '-' sign. Several of the conceptual models shown in this report do not attempt to delineate direction of impact. Rather, they simply show the linkages between system components as they are thought to exist by the Focus St. Louis group.

These diagrams are helpful for finding problems in conceptual models and are often used to outline a *dynamic hypothesis* of the structure of a system. One drawback to these tools is the lack of variable or relationship quantification – it is impossible to tell which variables are influential to the behavior of a system, and which variable relationships are weak or strong. Therefore, it becomes important to translate these conceptual models into more quantified versions. The STELLA modeling platform (<http://www.hps-inc.com>) was



Gateway Blueprint Model Workshop 2005 *Metropolitan Forum's "More for Your Money" Social Modeling Exercise*

used to outline broad initial possibilities for the creation of rigorous quantitative models of the system outlined in the FOCUS St. Louis report.

Conceptual Modeling Work

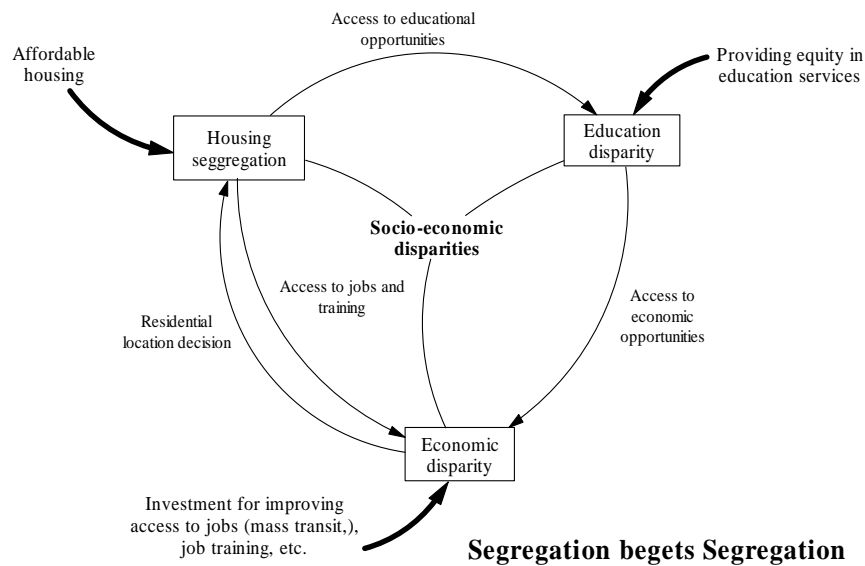
FOCUS St. Louis has put forth a conception of socio-economic disparities. This conception is implicitly based on mental models that attempt to understand the underlying causes of these disparities. This was done in order to make sense of symptoms (expressed in statistics) that point to many types of persistent inequality, including housing segregation and educational and income disparities. The linkages between these broad models are shown below (Figure 1). Here, segregation and inequity is depicted in boxes, with the forces driving each of these shown as links between the boxes. Remedies suggested in the report are shown with **bold arrows** pointing into each of the boxes.

Here, the linkages between these three forums for inequality form a loop which points directly to persistent inequality passed between generations. This implies that those growing up in low-quality neighborhoods (commonly low-income, low-tax revenue, and unsafe) tend to get low quality educations, leading to low quality jobs, forcing them to live in low-quality neighborhoods, where they raise their families and continue the cycle. This is exacerbated by the tendency for families caught in this situation to have low social and physical mobility, making it difficult to seek new places to live, gain training, and find better employment.



Gateway Blueprint Model Workshop 2005 Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Figure 1: Socio-Economic Disparities



The Metropolitan Forum is particularly interested in efficiently utilizing public investment in order to ease racial and economic disparities in the St. Louis region. Figure 2 shows three distinct frameworks for looking at this issue. The first views public investment channeled through specific issues in order to close racial and economic disparities and increase regional economic development. The second views public investment as a tool for altering the trajectory of current economic development. The third views public investment programs as mechanisms that can be modified to focus on region-specific issues in order to enhance economic development. Although these three frameworks essentially speak to the same issue, the framing of the issue is important in order to accurately and efficiently model the effects of public investment in the sphere of social inequality and regional economic development.

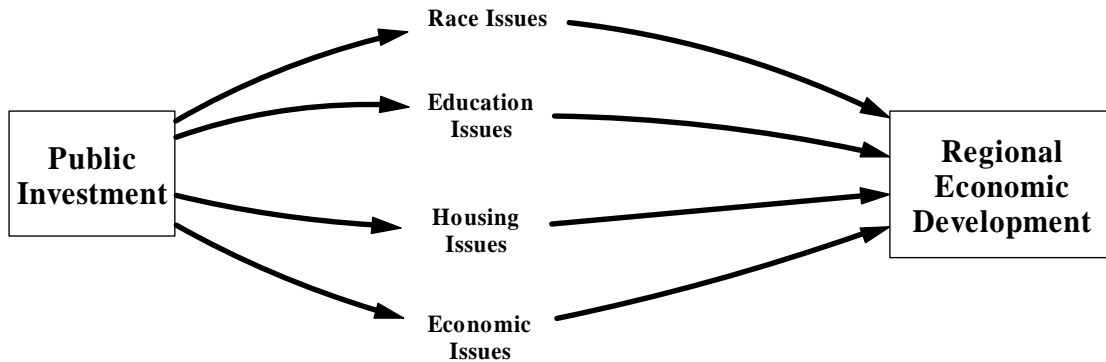


Gateway Blueprint Model Workshop 2005

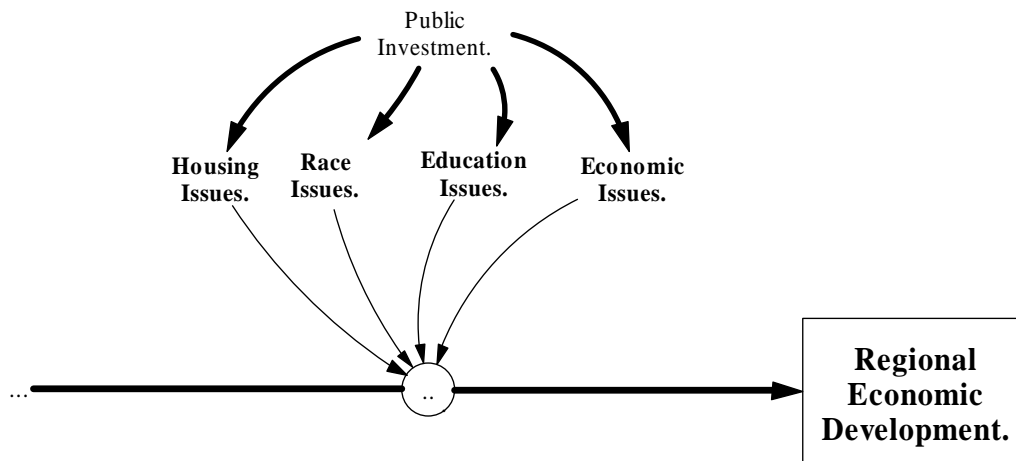
Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Figure 2: Different Frameworks for Understanding the Role of Public Investment in Achieving Regional Economic Development

Framework 1: Public investment channeled through specific issues



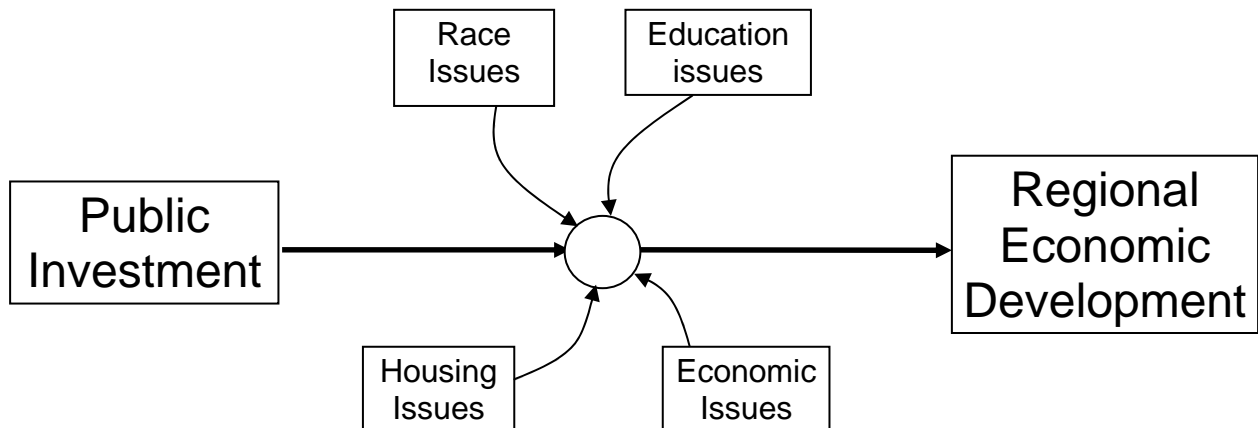
Framework 2: Public investment changes trajectory of regional economic development





Gateway Blueprint Model Workshop 2005 *Metropolitan Forum's "More for Your Money" Social Modeling Exercise*

Framework 3: Public investment program influenced by region-specific issues

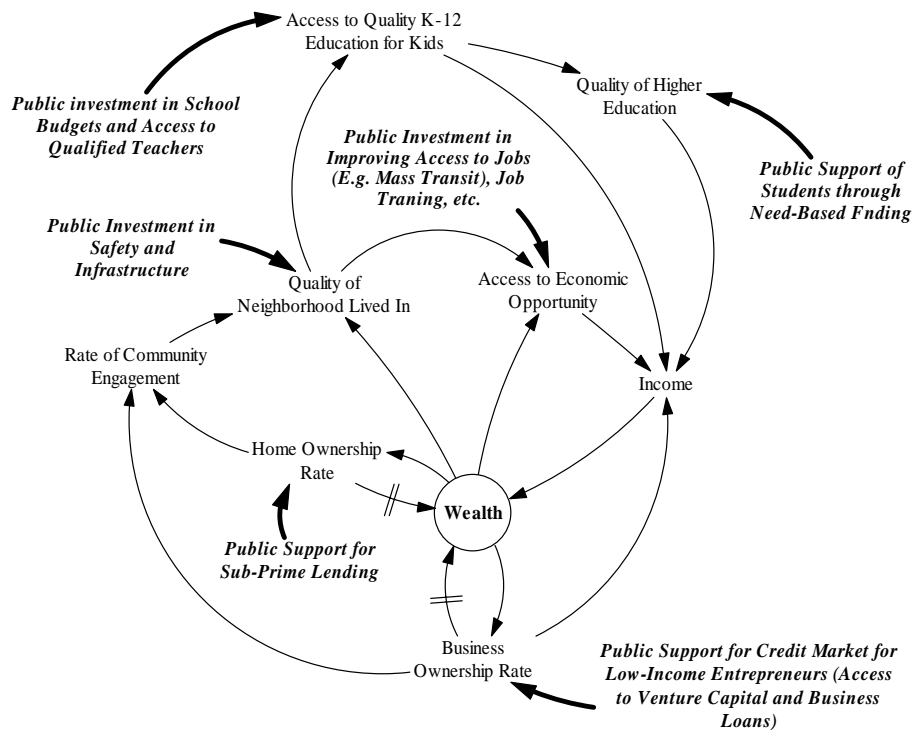


It is important now to refocus this discussion and become slightly more specific in discussing the role of public investment in affecting wealth intergenerational transfer. The majority of the modeling work on this project has been focused on the dynamics of wealth transfer and accumulation. Specifically, we looked at potential leverage points that could be used by parties interested in focusing public investment as a means for reducing wealth inequality. The diagram below shows the linkages depicted in the FOCUS St. Louis report relating to wealth accumulation and transfer. This model is inherently dynamic since wealth accumulation and intergenerational transfer often occur over long periods of time. The report suggests that this may be why many policies focused on achieving racial and economic equality have had limited success.



Gateway Blueprint Model Workshop 2005 Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Figure 3: FOCUS St. Louis Linkages in Wealth Accumulation and Transfer System



This diagram (Figure 3) shows home and business ownership rates to be major factors in determining the extent of intergenerational wealth transfer. The role of income in wealth accumulation is influenced by education, access to avenues of economic opportunity (job connections, proper training, transportation, mobility, location, etc.), and business ownership role (owners tend to have higher incomes than employees). Furthermore, community engagement and wealth both play important roles in neighborhood quality. The FOCUS St. Louis report shows neighborhood quality and safety to be important factors in the promotion or prevention of wealth transfer. This diagram spells out leverage points for public investment in increasing quality of neighborhoods and education, business and home ownership rate, and access to economic opportunity.

A conceptual model of neighborhood segregation as described in the report was also constructed. This model incorporates a much more explicit look at *racial* inequality than other models, since racial segregation is specifically viewed in terms of neighborhood



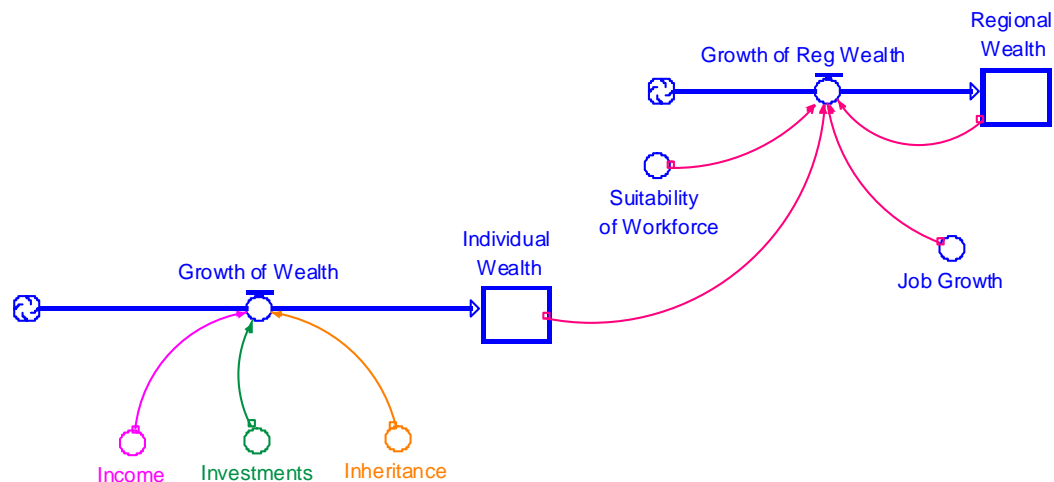
Gateway Blueprint Model Workshop 2005 Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Although this is not the case in the FOCUS St. Louis report, we can still explore some of the dynamics associated with quantitative modeling of social inequality in the St. Louis region.

STELLA modeling

STELLA is a rapid modeling environment created by High Performance Systems, Inc (<http://www.hps-inc.com>). This software uses an efficient graphical programming language as an interface for creating models that are easily used as for teaching purposes, as well as powerful research tools. Here, STELLA has been used to construct initial quantitative models that relate to the wealth model explored above in Figure 3. Regional wealth growth is a product of job growth, workforce suitability (in the face of economic transitions) and individual wealth. Individual wealth is a product of wealth accumulation through inheritance (intergenerational transfer), current income, and investments (including business and home ownership, as well as other investments such as stocks, bonds, etc.). These relationships are shown in Figure 5.

Figure 5: Regional Wealth Accumulation

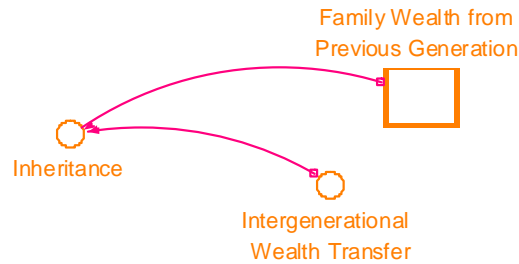


The specific intergenerational transfer of wealth is viewed to be wealth inherited, which is a function of both previous family wealth and the fraction that is transferred to the next generation. Figure 6 shows the STELLA diagram denoting these linkages.



Gateway Blueprint Model Workshop 2005 *Metropolitan Forum's "More for Your Money" Social Modeling Exercise*

Figure 6: Intergenerational Wealth Transfer



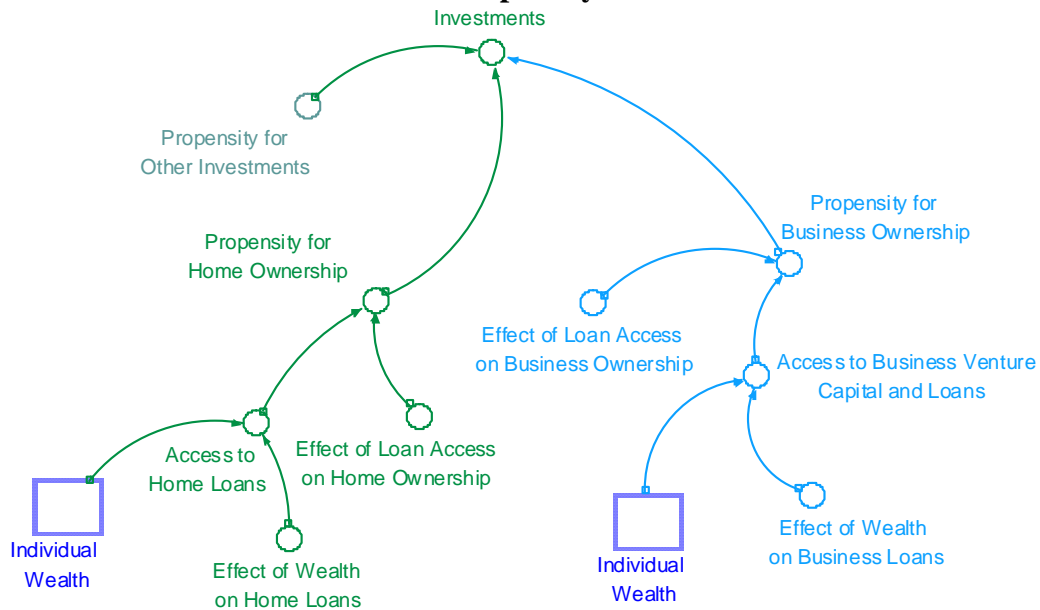
Secondly, figure 5 shows that investments contribute to wealth accumulation. Investments are largely viewed as functions of home and business ownership propensity. These propensities are determined by access to loans and the effect of wealth feedback into loans (see Figure 7). Banks and other lending institutions view low-wealth individuals as high loan risks, thereby making it difficult to get loans (and subsequent homes and businesses) without wealth in the first place. This creates a vicious cycle in wealth accumulation for those with low intergenerational transfer of wealth. Stated otherwise, if you have no original wealth (passed to you from other generations through educational support, neighborhood choice, or monetary inheritance), these institutional barriers make it very difficult to acquire the means for creating wealth (home and business ownership).



Gateway Blueprint Model Workshop 2005

Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Figure 7: Investment Accumulations are a Function of Home and Business Ownership Propensity

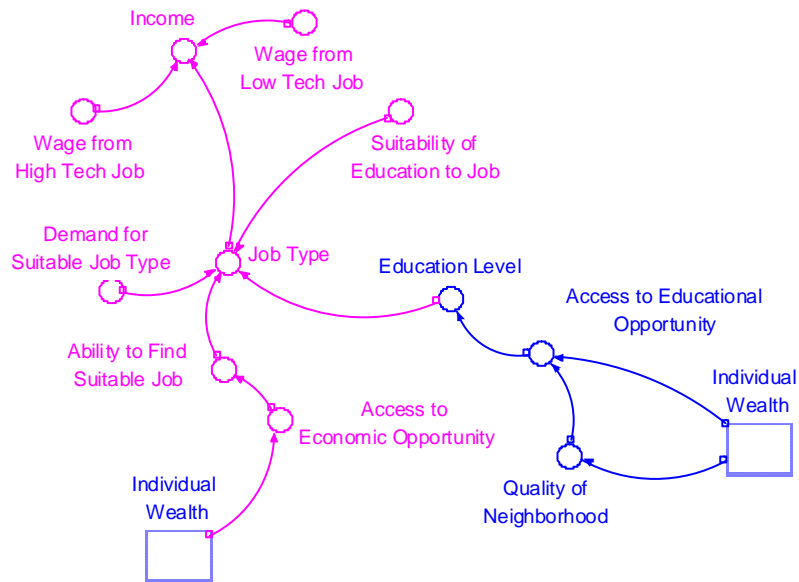


Finally, income as a determinant of wealth accumulation is modeled as a function of education, job type, and corresponding wage. This part of the model attempts to incorporate the report's important point that economic transitions in the St. Louis area have left many individuals improperly trained for new job markets. Figure 8 shows the linkages within this part of the model.



Gateway Blueprint Model Workshop 2005 Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Figure 8: Income as a Function of Education, Job Type, and Job Suitability



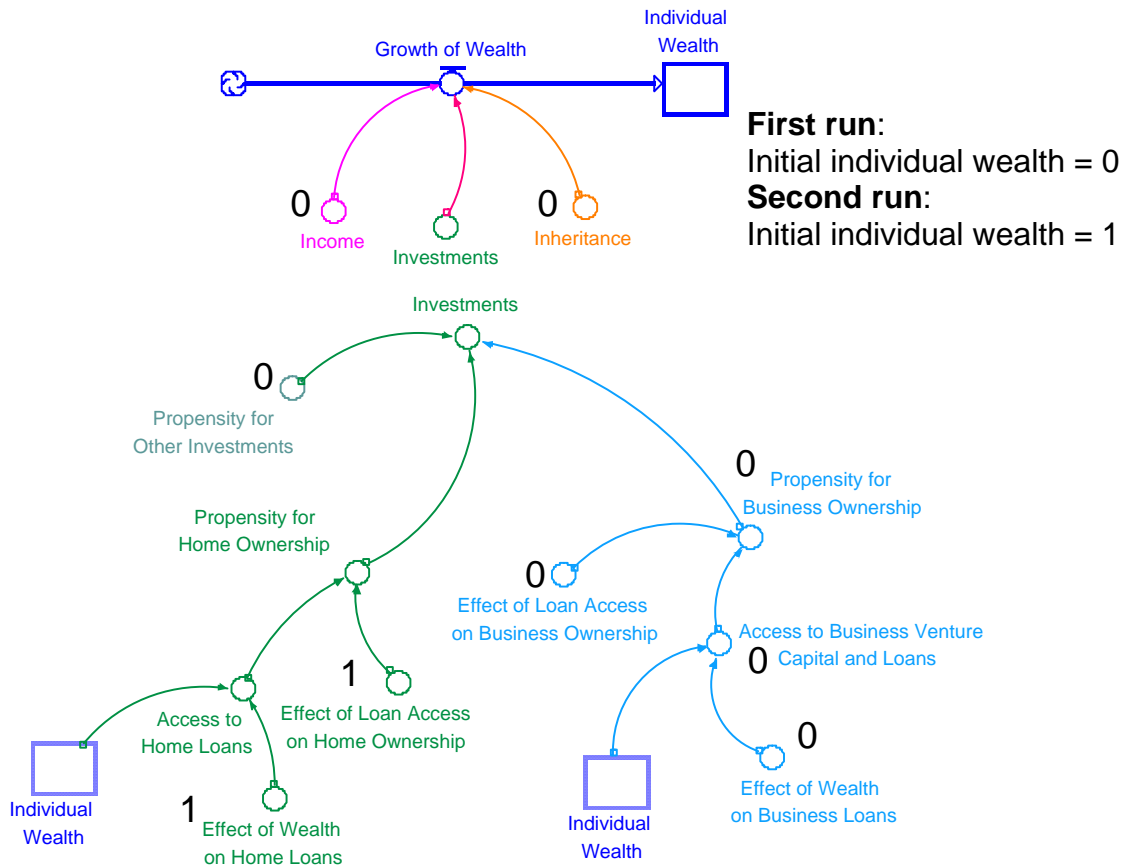
We have established a very basic example of a working version of this model, whereby the focus falls on investments and the role of *initial individual wealth*. The effects of all other variables are set to zero, with home ownership effects on loan access and wealth having a value of one (Figure 9). In this case, it becomes apparent that feedback between *initial wealth* and overall *individual wealth* is quite strong, even when only looking at the effects of home ownership (see Figure 10).



Gateway Blueprint Model Workshop 2005

Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Figure 9: Example Model Depicting Impact in Initial Wealth Changes



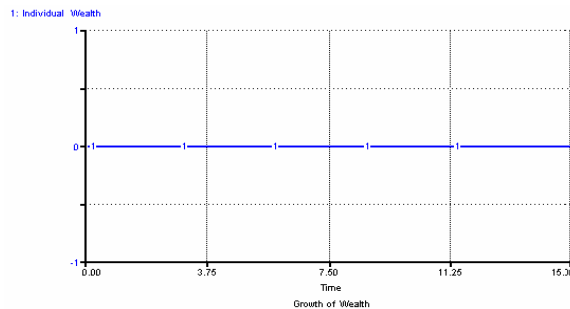
The case in which an individual has zero (or near zero) wealth means that he/she is unable to attain loans for home purchase. We can see that this means that the individual cannot take advantage of the wealth-begets-wealth feedback that comes with having easy access to loans due to initial individual wealth. Figure 10 shows the exponential growth of wealth during a given period of time when initial wealth exists. It also shows the case in which initial wealth does not exist, and wealth is difficult to generate due to the social and economic barriers to obtaining loans for investments. This basic depiction of wealth confirms the FOCUS St. Louis report's understanding of initial economic means as an important pre-condition for generating wealth during the next generation.



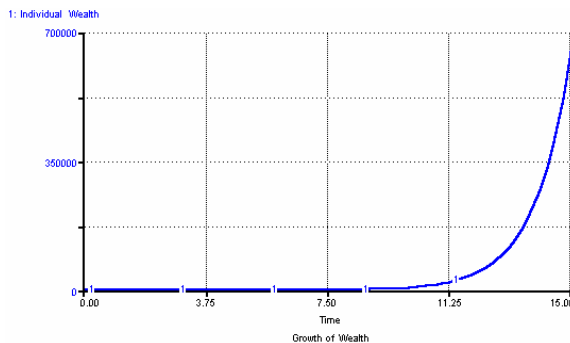
Gateway Blueprint Model Workshop 2005 Metropolitan Forum's "More for Your Money" Social Modeling Exercise

Figure 10: Example Model Results Demonstrating Intergenerational Feedback in Wealth Accumulation

First run:
Initial Individual
Wealth = 0



Second run:
Initial Individual
Wealth = 1



Conclusions and Further Work

This report summarizes initial attempts at modeling the complex system that express themselves through social and racial inequality statistics in the FOCUS St. Louis report. Explicit conceptual models were constructed using causal maps derived from mental models expressed by FOCUS St. Louis. These conceptual models were then broadly translated into models that attempted to quantify these system linkages.

The conceptual and quantitative models created herein can only be improved upon after more information is acquired. This information needs to inform the magnitude of linkages contained in the model. For example, how do we quantify "access to home loans?" Furthermore, how do we quantify the effect of this access to home ownership? How does home ownership affect individual wealth? All of the linkages implied in the FOCUS St. Louis report need to have quantitative measures applied to them.

On another front, the goal of this modeling exercise needs to be more tightly defined. Modeling an entire region's social inequality will require intimate quantitative knowledge of all of the cause and effect relationships and how they are tied to specific socio-economic



Gateway Blueprint Model Workshop 2005

Metropolitan Forum's "More for Your Money"

Social Modeling Exercise

groups. Alternatively, this modeling work could be completed at the individual level – looking at the ability of a given person to acquire wealth given their initial life conditions (such as neighborhood, parents' wealth, education, etc.). This type of modeling will also require more information about specific cause and effect relationships informing system linkages.

Consequently, the next steps will involve 1) further refining the model's intentions and scope, 2) identifying and gather data available for the model, 3) testing the implementation of the model, and 4) presenting to the East-West Gateway for feedback.